UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,001	09/05/2003	Ravi Narasimhan	MP0256	7519

			EXAMINER
26200	7590	02/08/2006	PHAN, HUY Q

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ART UNIT	PAPER NUMBER
2687	

DATE MAILED: 02/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/656,001	NARASIMHAN, RAVI
	Examiner	Art Unit	
	Huy Q. Phan	2687	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 December 2005*.

2a)☒ This action is **FINAL.**   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,4-11,13,15-22,24,26-33,35,37-44,46 and 48-59* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,4-11,13,15-22,24,26-33,35,37-44,46 and 48-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All   b)☐ Some * c)☐ None of:

　　　1.☐ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   This Office Action is in response to Amendment filed on date: 12/13/2005.

Claims 2, 4-11, 13, 15-22, 24, 26-33, 35, 37-44, 46 and 48-59 are still pending.

Claims 1, 3, 12, 14, 23, 25, 34, 36, 45 and 47 are cancelled.

Claims 56-59 are newly added.

Response to Arguments

2.   Applicant's arguments with respect to claims 2, 4-11, 13, 15-22, 24, 26-33, 35,

37-44, 46 and 48-59 have been considered but are moot in view of the new ground(s) of

rejection.

Claim Rejections - 35 USC § 112

3.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

Claims 9, 11, 20, 22, 31, 33, 42, 44, 53 and 55 are rejected under 35 U.S.C. 112,

second paragraph, as being indefinite for failing to particularly point out and distinctly

claim the subject matter which applicant regards as the invention.

All expressions and variables in the equations must be defined.

Claim 56 recites the limitation "The method" in the first line. There is insufficient

antecedent basis for this limitation in the claim.

Claim 57 recites the limitation "The method" in the first line. There is insufficient

antecedent basis for this limitation in the claim.

Claim 58 recites the limitation "The method" in the first line. There is insufficient

antecedent basis for this limitation in the claim.

Claim 59 recites the limitation "The method" in the first line. There is insufficient

antecedent basis for this limitation in the claim.

Claim Objections

4.   Claims 35 and 56 are objected to because of the following informalities: Claims

35 and 56 are duplicated.

        Appropriate correction is required.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 4-10, 13, 15-19, 21, 24, 26-30, 32, 35, 37-41, 43, 46, 48-52, 54 and 57

are rejected under 35 U.S.C. 103(a) as being unpatentable over Malaender (US-

2003/0223391) in view of Kadous (US-6,801,580).

Regarding claims 4, Malaender teaches a method comprising:

selecting a subset of active antennas from a plurality of available antennas in an multi-

element antenna system based on higher-order statistics of a propagation medium

([0043]-[0051]; described as "channel coefficient matrix"). But, Malaender fails to

expressly teach selecting a constellation for transmission on the active antennas where

said selecting the constellation for transmission on the active antennas comprises

selecting different constellations two or more of the active antennas. However, Kadous

teaches a similar method of "patial receiver processing techniques include a channel

correlation matrix inversion (CCMI) technique (which is also referred to as a zero-forcing

technique) and a minimum mean square error (MMSE) technique" (see col. 20, lines 29-

37); thus, making it analogous art since it is in the same field of endeavor. Kadous

further teaches selecting a constellation for transmission on the active antennas (col.

17, lines 40-59; for more details see fig. 5, cols. 16-18) where said selecting the

constellation for transmission on the active antennas comprises selecting different

constellations two or more of the active antennas (col. 14, lines 6-10, for more details

see fig. 4 and cols. 14-16). Therefore, it would have been obvious to one of ordinary

skill in the art at the time the applicant's invention as taught by Kadous in the method of

Malaender in order to "process a number of received symbol streams in a MIMO system

with multipath channels such that improved performance may be achieved when using

successive interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 7, Malaender teaches a method comprising:

selecting a subset of active antennas from a plurality of available antennas in an

multi-element antenna system based on higher-order statistics of a propagation medium

([0043]-[0051]; described as "channel coefficient matrix"). But, Malaender fails to

expressly teach where said selecting comprises selecting an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margin. Kadous further teaches

where said selecting comprises selecting an optimum number of antennas to maximize

a minimum signal-to-noise (SNR) margin (col. 16, lines 15-33; for more details see cols.

11-16). Therefore, it would have been obvious to one of ordinary skill in the art at the

time the applicant's invention as taught by Kadous in the method of Malaender in order

to "process a number of received symbol streams in a MIMO system with multipath

channels such that improved performance may be achieved when using successive

interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 15, Malaender teaches an apparatus (fig. 1B) comprising:

a processor (fig. 1B, 140) operative to select a subset of active antennas from a

plurality of available antennas in an multi-element antenna system based on higher-

order statistics of a propagation medium ([0043]-[0051]; described as "channel

coefficient matrix"). But, Malaender fails to expressly teach wherein the processor is

operative to select a constellation for transmission on the active antennas and select

different constellations two or more of the active antennas. Kadous further teaches

wherein the processor (col. 21, lines 3-11) is operative to select a constellation for

transmission on the active antennas (col. 17, lines 40-59; for more details see fig. 5,

cols. 16-18) and select different constellations two or more of the active antennas. (col.

14, lines 6-10, for more details see fig. 4 and cols. 14-16). Therefore, it would have

been obvious to one of ordinary skill in the art at the time the applicant's invention as

taught by Kadous in the method of Malaender in order to "process a number of received

symbol streams in a MIMO system with multipath channels such that improved

performance may be achieved when using successive interference cancellation (SIC)

receiver processing" (see SUMMARY).

Regarding claims 18, Malaender teaches an apparatus (fig. 1B) comprising:

a processor (fig. 1B, 140) operative to select a subset of active antennas from a

plurality of available antennas in an multi-element antenna system based on higher-

order statistics of a propagation medium ([0043]-[0051]; described as "channel

coefficient matrix"). But, Malaender fails to expressly teach where the processor is

operative to select a constellation for transmission on the active antennas and select an

optimum number of antennas to maximize a minimum signal-to-noise (SNR) margin.

Kadous further teaches where the processor (col. 21, lines 3-11) is operative to select a

constellation for transmission on the active antennas and select an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margin (col. 16, lines 15-33; for

more details see cols. 11-16). Therefore, it would have been obvious to one of ordinary

skill in the art at the time the applicant's invention as taught by Kadous in the method of

Malaender in order to "process a number of received symbol streams in a MIMO system

with multipath channels such that improved performance may be achieved when using

successive interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 26, Malaender teaches an apparatus (fig. 1B) comprising:

a processor (fig. 1B, 140) including means for selecting a subset of active

antennas from a plurality of available antennas in an multi-element antenna system

based on higher-order statistics of a propagation medium. But, Malaender fails to

expressly teach means for selecting a constellation for transmission on the active

antennas including means for selecting different constellations two or more of the active

antennas. Kadous further teaches means for selecting a constellation for transmission

on the active antennas (col. 17, lines 40-59; for more details see fig. 5, cols. 16-18)

including means for selecting different constellations two or more of the active antennas

(col. 14, lines 6-10, for more details see fig. 4 and cols. 14-16). Therefore, it would have

been obvious to one of ordinary skill in the art at the time the applicant's invention as

taught by Kadous in the method of Malaender in order to "process a number of received

symbol streams in a MIMO system with multipath channels such that improved

performance may be achieved when using successive interference cancellation (SIC)

receiver processing" (see SUMMARY).

Regarding claims 29, Malaender teaches an apparatus (fig. 1B) comprising:

a processor (fig. 1B, 140) including means for selecting a subset of active

antennas from a plurality of available antennas in an multi-element antenna system

based on higher-order statistics of a propagation medium. But, Malaender fails to

expressly teach where said selecting comprises selecting an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margin. Kadous further teaches

where said selecting comprises selecting an optimum number of antennas to maximize

a minimum signal-to-noise (SNR) margin (col. 16, lines 15-33; for more details see cols.

11-16). Therefore, it would have been obvious to one of ordinary skill in the art at the

time the applicant's invention as taught by Kadous in the method of Malaender in order

to "process a number of received symbol streams in a MIMO system with multipath

channels such that improved performance may be achieved when using successive

interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 37, Malaender teaches a system (fig. 1) comprising:

a propagation medium (fig. 1A, 130);

a first transceiver including a plurality of available antennas (fig. 1A; antennas

111a-m);

a second transceiver including a plurality of available antennas (fig. 1A; antennas

121a-n);

a processor (fig. 1B, 140) operative to determine higher-order statistics of a

propagation medium from signals received from the plurality of available antennas at

the first transceiver ([0046]-[0047]); and antennas selection module operative to select a

subset of active antennas from a plurality of available antennas in an multi-element

antenna system based on higher-order statistics of a propagation medium ([0046]-

[0047]).But, Malaender fails to expressly teach where the processor is operative to

select a constellation for transmission on the active antennas and select different

constellations two or more of the active antennas. Kadous further teaches where the

processor (col. 21, lines 3-12) is operative to select a constellation for transmission on

the active antennas (col. 17, lines 40-59; for more details see fig. 5, cols. 16-18) and

select different constellations two or more of the active antennas (col. 14, lines 6-10, for

more details see fig. 4 and cols. 14-16). Therefore, it would have been obvious to one of

ordinary skill in the art at the time the applicant's invention as taught by Kadous in the

method of Malaender in order to "process a number of received symbol streams in a

MIMO system with multipath channels such that improved performance may be

achieved when using successive interference cancellation (SIC) receiver processing"

(see SUMMARY).

Regarding claims 40, Malaender teaches a system (fig. 1) comprising:

a propagation medium (fig. 1A, 130);

a first transceiver including a plurality of available antennas (fig. 1A; antennas

111a-m);

a second transceiver including a plurality of available antennas (fig. 1A; antennas

121a-n);

a processor (fig. 1B, 140) operative to determine higher-order statistics of a

propagation medium from signals received from the plurality of available antennas at

the first transceiver ([0046]-[0047]); and

antennas selection module operative to select a subset of active antennas from a

plurality of available antennas in an multi-element antenna system based on higher-

order statistics of a propagation medium ([0046]-[0047]). But, Malaender fails to

expressly teach where the processor is operative to select an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margin. Kadous further teaches

where the processor (col. 21, lines 3-12) is operative to select an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margin (col. 16, lines 15-33; for

more details see cols. 11-16). Therefore, it would have been obvious to one of ordinary

skill in the art at the time the applicant's invention as taught by Kadous in the method of

Malaender in order to "process a number of received symbol streams in a MIMO system

with multipath channels such that improved performance may be achieved when using

successive interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 48, Malaender teaches a computer program [0054] comprising

the steps of:

selecting a subset of active antennas from a plurality of available antennas in an

multi-element antenna system based on higher-order statistics of a propagation medium

([0043]-[0051]; described as "channel coefficient matrix"). But, Malaender fails to

expressly teach selecting a constellation for transmission on the active antennas where

said selecting the constellation for transmission on the active antennas comprises

selecting different constellations two or more of the active antennas. Kadous further

teaches selecting a constellation for transmission on the active antennas where said

selecting the constellation for transmission on the active antennas (col. 17, lines 40-59;

for more details see fig. 5, cols. 16-18) comprises selecting different constellations two

or more of the active antennas (col. 14, lines 6-10, for more details see fig. 4 and cols.

14-16). Therefore, it would have been obvious to one of ordinary skill in the art at the

time the applicant's invention as taught by Kadous in the method of Malaender in order

to "process a number of received symbol streams in a MIMO system with multipath

channels such that improved performance may be achieved when using successive

interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claims 51, Malaender teaches a computer program [0054] comprising

the steps of:

selecting a subset of active antennas from a plurality of available antennas in an

multi-element antenna system based on higher-order statistics of a propagation medium

([0043]-[0051]; described as "channel coefficient matrix"). But, Malaender fails to

expressly teach where said selecting comprises selecting an optimum number of

antennas to maximize a minimum signal-to-noise (SNR) margi. Kadous further teaches

where said selecting comprises selecting an optimum number of antennas to maximize

a minimum signal-to-noise (SNR) margin (col. 16, lines 15-33; for more details see cols.

11-16). Therefore, it would have been obvious to one of ordinary skill in the art at the

time the applicant's invention as taught by Kadous in the method of Malaender in order

to "process a number of received symbol streams in a MIMO system with multipath

channels such that improved performance may be achieved when using successive

interference cancellation (SIC) receiver processing" (see SUMMARY).

Regarding claim 2, 13, 24, 35, 57 and 46, Malaender and Kadous disclose all the

limitations of claims 4, 15, 26, 37, 40 and 48 respectively. Malaender further teaches

wherein the higher-order statistics comprise second-order statistics of the propagation

medium ([0046]-[0047]).

Regarding claim 5, 16, 27, 38 and 49, Malaender and Kadous disclose all the

limitations of claims 4, 15, 26, 37 and 48 respectively. Kadous further teaches wherein

the multi-element antenna system comprises a multiple-in multiple-out (MIMO) system

(see abstract).

Regarding claim 6, 17, 28, 39 and 50, Malaender and Kadous disclose all the

limitations of claims 4, 15, 26, 37 and 48 respectively. Malaender further teaches

wherein said selecting comprises selecting the subset of active antennas based on

correlation matrices among the active antennas ([0046]-[0047]).

Regarding claim 8, 19, 30, 41 and 52, Malaender and Kadous disclose all the

limitations of claims 4, 15, 26, 37 and 48 respectively. Malaender further teaches

wherein said selecting comprises selecting the subset of active antennas based on a

fixed data rate [0018].

Regarding claim 10, 21, 32, 43 and 54, Malaender and Kadous disclose all the

limitations of claims 4, 15, 26, 37 and 48 respectively. Kadous further teaches allocating

substantially equal power to each of said active antennas (col. 15, lines 63-67).

Allowable Subject Matter

6.   Claims 9, 11, 20, 22, 31, 33, 42, 44, 53, 55, 58 and 59 would be allowable if

rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph,

set forth in this Office action.

Conclusion

7.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37
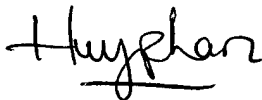
CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

8.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Huy Q Phan whose telephone number is 571-272-7924.

The examiner can normally be reached on 8AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kincaid G Lester can be reached on 571-272-7922. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

SONNY TRINH
PRIMARY EXAMINER

Examiner: Phan, Huy Q.   AU: 2687   Date: 02/02/2006